Reprinted from the Archives of Physical Therapy
January, 1941, Vol. XXII, pp. 21-26

ELECTROSURGERY IN ADVANCED CANCER AND RECONSTRUCTION *

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NEW YORK

As has been the case with every new instrument, pharmaceutical, or mode of treatment, electrosurgery has suffered from uncritical enthusiasm and unwarranted conclusions. The dogma was evolved that electrosurgery is the method of choice in treating cancer and that it should replace the scalpel because it seals the capillaries and prevents the dissemination of cancer cells.

To investigate this problem I began experiments in this field ten years ago. On the basis of such clinical experience the conclusion has been reached that electrosurgery seems to have a definite place in the treatment of malignancies, as was indicated in previous papers.[1, 2]

The early enthusiasm which was based on the manifold theoretic advantages was dampened, and in the field of oncology the surgical use of the high frequency currents was curtailed to the treatment of precancerous lesions, and exceptionally early cancers of the skin and mucosa, as well as suitable forms of recurrent and advanced cancer.

In the Skin and Cancer Unit of the New York Post-Graduate Hospital all primary operable malignant tumors are treated by surgery except those for which radiation has proved of superior value. During major operations electrohemostasis with proper precaution and limitation is currently used as a time and material saving method. This paper is presented to report personal experiences and to encourage more extensive use of electrosurgical methods in selected cases of advanced cancer.

Indications and Technic of Electrosurgery

Cancerous growths in the borderline and far advanced cases can seldom be eradicated and all that is hoped for is palliation. Permanent or temporary improvement of local and general processes in localized tumors may be obtained by electrosurgery in advanced, ulcerated cancer. Even in the presence of demonstrable distant metastasis after the removal of the foul infected lesions patients may be temporarily rehabilitated. Therefore, electrosurgical methods are indicated in those selected cases of advanced cancer where the removal of an extensive, usually ulcerated tumor may improve the local and general condition in spite of the fact that scalpel surgery and radiation fails.

Whenever possible the cancerous lesion is circumscribed in the healthy tissues with a heavy coagulating cutting current in order to sever the superficial circulation and to allow shrinkage of the tissues to be coagulated according to the Keysser technic.[3]

For coagulation purposes one may use flat, disc, roller or bipolar electrodes. The size and shape of the different electrodes vary according to the depth and extent of the lesions. From a practical viewpoint one may say that with a sufficiently powerful apparatus the depth of coagulation obtained is approximately equal to the width of the electrode. With proper technic, the tissues are not carbonized but coagulated (cooked), exhibiting a homogeneous texture. This can be removed bloodlessly by a curette or preferably by an electric cutting loop.

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* Read by Invitation before a Teaching Clinic of the New England Medical Center, Boston Dispensary, Boston, January 27, 1939.

Such piecemeal removal of the coagulated tumor tissues is entirely different from the principle of scalpel surgery by which the tumor is excised in a block in the healthy tissues. The principle of electrosurgery is to follow the tumor, eradicate it if possible, and then to remove a margin of "healthy" tissue to prevent recurrence. Such pursuit of tumor tissue is facilitated by the fact that the experienced eye readily differentiates the coagulated tumor tissues from apparently healthy tissues. This can be well demonstrated, e.g. in cancer of the tongue. The use of easily serviceable and powerful apparatus which allows speedy work is important.

Electrosurgical eradication of infected tumor-tissue may be conceived as the first stage of the operation which is immediately followed by the closure of the defect (after the patient is re-draped) by a skin flap. The removal of all coagulated tissues prevents postoperative complications. No matter how desirable it may be to perform reconstruction at the same time, it often has to be postponed for observation of possible local recurrence or of incomplete removal of the tumor. Secondary granulating surfaces are skin-grafted or in some instances (as in the mouth or rectum) the wound is left to heal spontaneously.

Extensive, ulcerating primary or recurrent tumors may be entirely eradicated. Temporary control of the tumor growth invariably follows a single or repeated intervention. The minimal loss of blood during operation renders the procedure one of comparative safety. In my experience (on 100 cases) none had shock. Therefore, we may conclude that a weakened general condition is not a contraindication for palliative electrocoagulation. Attempts to eradicate or control a tumor can be made gradually at intervals conforming to the patient's condition; meanwhile supportive treatment is given. As the wound surface is covered by a film of coagulated tissue and protected from mechanical and chemical irritation until granulation appears, operations are followed by reduced postoperative complaints.

The removal of a malodorous ulcerated tumor induces comfort and morale. It also constitutes a relatively simple surgical procedure for palliation. In my experience the postoperative mortality was 3 per cent in 100 cases. Considering poor general condition and advanced malignant disease, this is a low rate.

Postoperative complications are infections and hemorrhage. Both may be avoided with care. Antiseptic dressing (preferably boric acid powder or a solution of peroxide) will control pyocyanic infection which often complicates untreated coagulated wounds. Hemorrhage may be prevented by carefully placed ligatures during the operation.

Case Reports

Case 1. — Admitted 11-20-29. Diagnosis: Recurrent basal cell epithelioma of scalp with bone invasion. The patient, a white male, aged 59 years, gave a history of having had a small cyst on the scalp which he injured while coming out of the cellar. It healed and did not bother him until nine or ten months previous to admission at which time it opened up, bled and discharged pus. He used some home remedies on it, and the wound had healed periodically. He finally went to a physician who treated him with an electric needle, mercurochrome, silver nitrate, salves and injections, but, as the wound did not heal, he was referred to the hospital.

Since that time (during the last three years) he had five operations and two courses of radiation. At the last admission a heaped-up carcinomatous ulcer invading the bone, and measuring about 12 by 7 cm. in diameter, was found. Over the vertex a pulsating ulceration over the exposed dura was present, 6 cm. in diameter (fig. 1). The patient was lying in bed in distress unable to move his left arm and leg. Besides moderate anemia, no other important process was noted. Hemiplegia at the left arm and leg improved after admission, permitting the electrosurgical operation for palliation which was performed under colonic anesthesia on June 8, 1933.

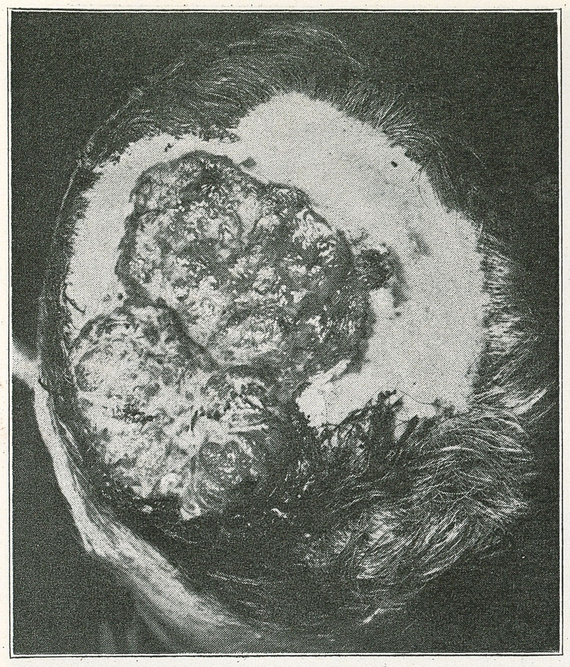

Fig. 1. — Recurrent basal cell carcinoma of scalp with invasion of the skull.

The tumor was circumscribed, coagulated and removed. Invasion of the scalp and the bone throughout the right frontal, parietal and temporal regions necessitated the removal of about one inch of the scalp around the tumor and underlying the uninvaded bones. At the base of the tumor mass the bone had been eroded and the dura exposed for an area about 3 by 5 cm. in diameter. After the cancerous tissues were coagulated it was curetted out. The exposed dura was superficially desiccated throughout, care being taken not to cause hemorrhage or perforation. In the hope that the last days of the patient might become more comfortable, an attempt was made to close the defect by an occipital scalp flap. The bone and skin edges damaged by the high frequency current were trimmed, and the defect was covered with a scalp flap from the occipital region (fig. 2). A drain was inserted under the flap. A skin graft from the thigh was applied to the denuded occipital surface. The patient left the operating room in a critical condition.

The temperature following the operation was irregular with peaks of 105 F.; pulse 150-160, for two days, then dropped to 99 F. and pulse 80-90 for five days, after which the temperature ranged between 103 and 99 F. and pulse 80-110 for the four weeks of his stay in the hospital. After gradual improvement of the local and general conditions he was discharged (7-6-33), with the wound healed, to the follow-up clinic.

After the operation there was comparative comfort for six months. Although able to walk the patient complained of occasional pains in the head and had not much vitality. After 7 months the wound began to discharge and recurrence was noted at the left side. There was no odor to the wound. The patient died February 2, 1934, nearly eight months after the last intervention, having lost consciousness for about ten days before he died. No postmortem examination was obtained.

This patient who had developed, after a probably inadequate first intervention (electric needle), an advanced lesion diffusely involving the skull, temporarily benefited by the electrosurgical removal of a foul infected carcinoma followed by immediate plastic reconstruction. The operative procedure most probably prolonged his life and made his disease more bearable to him as well as to his family.

Case 2. — Squamous cell carcinoma (grade 1) with inguinal lymph node involvement. The patient, a 51-year-old white male, stated that three years before he had had a cyst on the left thigh which was excised but reappeared one year later. In fourteen months a second operation, followed by a series of x-ray treatments, had been performed elsewhere before he was seen by us for a second recurrence. The patient was referred to the tumor clinic with a diagnosis of angiosarcoma. Biopsy taken

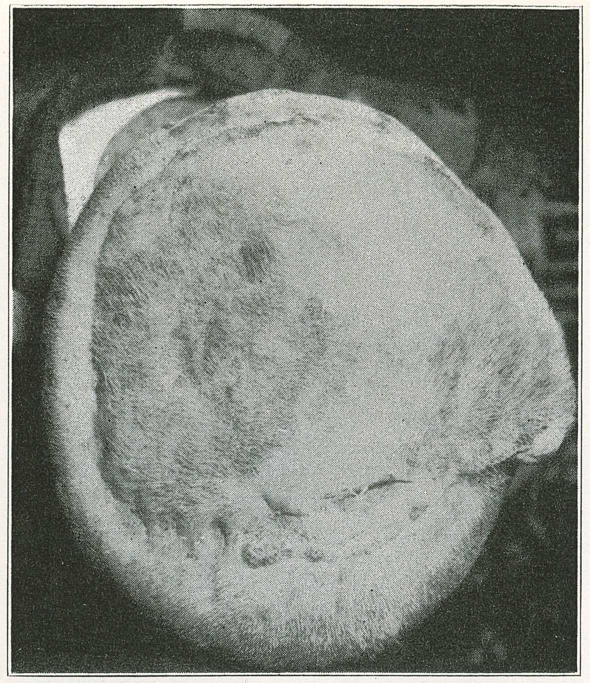

Fig. 2. — Immediate plastic repair following coagulation and eradication of tumor. Wound healed.

in the clinic was reported by Dr. D. S. D. Jessup, pathologist, as squamous carcinoma, grade 1, of the thigh.

Physical examination revealed on the lateral aspect of the left thigh, at the margin of the scar of the previous operations, a heaped-up, ulcerated tumor mass of rather foul odor, measuring 5 by 8 cm. in diameter (fig. 3). The tumor was fixed to the underlying tissues and diffusely infiltrated the subcutaneous tissues around the ulceration for about 1 to 2 cm. Firm palpable nodes were present in the left inguinal region. No other pathologic process was noted.

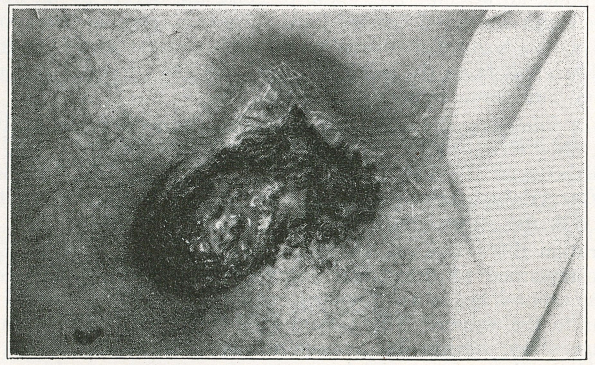

Fig. 3. — Recurrent carcinoma of the thigh with inguinal lymphnode involvement.

Electrosurgery was advised on account of the recurrent and infected lesion. Under spinal analgesia the tumor was coagulated with a roller and removed piecemeal with a loop electrode. The carcinoma appeared to be rather superficial and did not involve the underlying fascia lata and muscle. As a safety margin, after coagulation, the fascia was removed and the wound was superficially desiccated and was left open, covered with boric acid ointment dressing. Throughout the operation the bleeding was controlled with the current.

Routine inguinal node dissection was performed by Dr. Albert S. Morrow. At the operation the enlarged inguinal lymph nodes suggested carcinomatous involvement, which was confirmed by pathologic examination. Recovery was uneventful. There was some drainage from the inguinal wound but it finally healed by secondary granulation. Two weeks later the wound on the thigh, presenting healthy granulations (fig. 4), was subjected to a Thiersch graft. The patient left the hospital 26 days after admission.

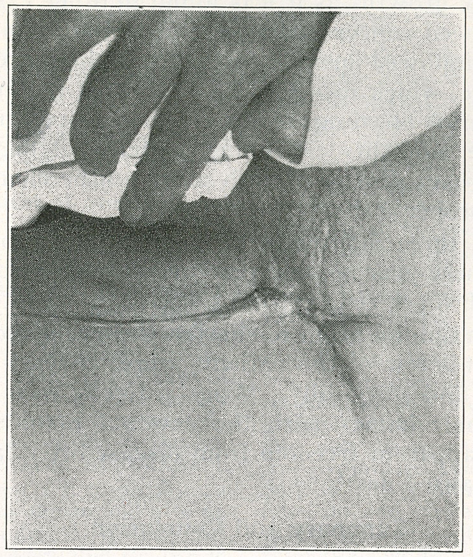

Fig. 4. — Healing after inguinal lymphnode dissection. Lymphnodes were involved.

Follow-up examination revealed no recurrence and the patient has been well for over six years (fig. 5).

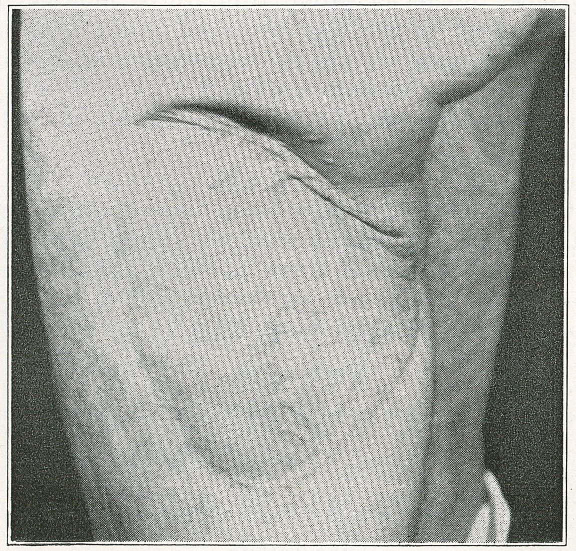

Fig. 5. — No recurrence after 6 years over the skin grafted area.

Comment

This case is presented to illustrate the electrosurgical procedure in a recurrent, infected carcinoma followed by secondary skin graft. Though scalpel surgery might have given us a similar result, in this case surgical application of the high frequency currents might be preferred.

It should be emphasized that in case of squamous cell carcinoma and melanoma a routine regional lymph node dissection improves the end results. It may be said that local excision of such malignant tumor followed by roentgen therapy to the regional lymph nodes might not have sufficed to control the metastatic growths as it was found in other cases.

In all, 100 advanced cancer cases were operated upon by electrosurgical methods. All were followed up. There were no instances of serious postoperative hemorrhage, which fact may be attributed to carefully placed ligatures to control arterial bleeding. All were major operations. There was a 3 per cent operative mortality, including patients dying in the hospital from advanced malignant disease. Death could not be charged to the electrosurgical operations proper.

Arrests for from three months to three years were obtained in the most advanced group. Three-year to five-year arrests were obtained in the less advanced group, with 8 per cent apparent five-year "cures."

The intervention did not seem to shorten the estimated life period in any of the cases. All but a few of the patients were, at least temporarily, benefited both mentally and physically. Many patients were rehabilitated[1] and able to return to their homes with the external manifestations of cancer eliminated, and this apparent freedom from disease often lasted until internal general metastases caused death.

Summary and Conclusion

1. More extensive use of electrosurgery in the form of coagulation is recommended in the ulcerated, recurrent advanced cancer where scalpel surgery and radiation fails.
2. Indications and technic are outlined.
3. Results with an operative mortality of 3 per cent in 100 cases are: palliation in the most advanced group from three months to three years. Three to five years arrest in the less advanced group with some five year "cures" (8 per cent). Immediate plastic reconstruction, if feasible, shortens hospitalization and improves ultimate results.
4. Two illustrated cases one from the far advanced and one from the least advanced group are presented.
5. Electrosurgery has proved a valuable addition to the control of advanced cancer. Good palliative results have been obtained, and these have lasted for periods of three months to over five years, depending on internal involvement. The hospital stay of these patients was shortened, and good results have been obtained in 26 per cent by immediate plastic reconstruction with the local control of the disease until death in the majority of the cases.

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Discussions

Dr. Channing C. Simmons (Boston): I have little to add to what Dr. Cholnoky has already stated, for my experience has not been as great as his. I will add, however, that I am very glad that he does not make extravagant claims for the method. I have read papers and bulletins published by other individuals who apparently believe that electrosurgery is the only method of treatment of cancer. Dr. Bovie developed the first machine of this character in which there was an accurate control of the coagulation and cutting current. Experimentally on the machine, however, the depth of coagulation was found to depend on the size of the electrodes and also upon the tissue. The current was deflected by the fascial planes and also bore some relation to the blood supply. Much of the early work on electrocoagulation was carried on in Sweden and I was much impressed by the work at the Radiumhemmet with two large active electrodes. Dr. Cholnoky spoke of this form of treatment.

Electrosurgery is important in the treatment of superficial growths such as large carcinomas of the scalp, but is particularly valuable in the treatment of cancer in and about the mouth. We have employed ether anesthesia for operations about the mouth using special technic to minimize the danger of explosions and to date, in a relatively large series of cases, have had no trouble. Following extensive operations on the tongue, however, secondary hemorrhage has occurred in about 25 per cent of the cases. The hemorrhage is often severe but we have had no deaths. It cannot be controlled by stitches taken about the coagulated area at the time of operation.

I wish to compliment Dr. Cholnoky on the photographs he has shown and also on the selection and number of instruments which are apparently adaptable for use in every type of tumor. I have had no experience in treatment of relatively deeply situated growths by this method but should feel there might be danger of injury of vital structures such as the large vessels in the neck, or if employed in the pelvis, to the ureters or large vessels.

Dr. Leland S. McKittrick (Boston): It is very difficult to discuss Dr. Cholnoky's paper because he has done such a splendid and complete job and because — and I am speaking personally now, not for anybody else — at least in my own experience electrosurgery has fallen far short of the excellence to which Dr. Cholnoky has carried it. He has well shown what a man, interested in developing a method, can accomplish when he applies himself; starting from the beginning, thoroughly acquainting himself with the instruments he is dealing with, what they will do, then applying this knowledge to his clinical cases.

One cannot but be impressed with the careful selection and discussion of cases. He does not say that the only way to treat cancer is by electrosurgery, but the cases which he has shown certainly show the excellence with which he has selected them and carried out the treatment. The results he has obtained are very striking. We know that he has a very good idea just how deeply his electrodes are coagulating. This bespeaks the confidence of experience and in the apparatus he works with. The safe and successful use of any therapeutic agent — whether it be x-ray, radium, or electrosurgery — which acts beyond the point of application requires a great deal of experience.

One word about rectal cases. Dr. Cholnoky is perfectly right, but I hope that his enthusiasm for electrosurgery in cancer of the rectum does not carry him too far. I was pleased that he mentioned papillomatous lesions in the discussion for it is this type of lesion where electrosurgery is useful. I have not said anything about them, but we have at Palmer a few — not too many, because I do not think there should be many — patients with papillomatous cancer of the rectum, patients all elderly or poor surgical risks, who after painstaking and careful electrocoagulation followed by radium implantation have, as suggested, been spared a colostomy and have lived for varying periods of time with surprising comfort. We now have several of these patients free from any evidence of disease after periods of six months to three years. I hope no one carries away the impression that a local procedure of this or any character is to be used except in very selected cases.

Dr. Ernest Daland (Boston): I have been interested in electrocoagulation since the day when Dr. Bovie developed his machine and I have treated a good many cases. Since that time, x-radiation has come to be used more and more instead of electrocoagulation, but there are still many cases where this can be applied, particularly in those that have not responded to x-radiation.

I think that we cannot impress one too much with the fact that these individuals are very free from pain after this very extensive procedure. Many physicians who see them being operated on think that they are going to have a great amount of pain. I always invite them to come and see the patient the next day.

It is interesting to see that Dr. Cholnoky had nine cases that have survived five years. I think that the important thing to remember about this is that one cannot tell positively which case is going to be palliated and which cured. I should like to show some slides of some cases treated for palliation, but in which a cure was obtained. I have not had any experience with as large electrodes such as Dr. Cholnoky has used; that is something very definite for us to try in the future.

NOTE: The reader interested in more detailed description of the technic and results is referred to the author's book now in preparation, "Rehabilitation in Advanced Cancer."